

# The Network — The Key to Transformation

COL Jonathan A. Maddux and Dr. Gerardo J. Melendez



**The Army's Future Combat Systems (FCS) network allows the FCS Family-of-Systems (FoS) to operate as a cohesive system-of-systems where the whole of its capabilities is greater than the sum of its parts. As the key to the Army's transformation, the network enables the Future Force to employ innovative and revolutionary operational and organizational concepts and enables Soldiers to perceive, comprehend, shape and dominate the future battlefield at unprecedented levels as defined by the FCS Operational Requirements Document.**

The FCS network consists of four overarching building blocks: System-of-Systems Common Operating Environment (SOSCOE); Battle Command software; communications and computers (CC); and intelligence, reconnaissance and surveillance (ISR) systems. The four building blocks synergistically interact enabling the Future Force to see first, understand first, act first and finish decisively.

## SOSCOE

Central to FCS network implementation is SOSCOE, which supports multiple mission-critical applications independently and simultaneously. It is configurable so that any specific instantiation can incorporate only the components that are needed for that instantiation. SOSCOE enables straightforward integration of separate software packages, independent of their location, connectivity mechanism and the technology used to develop them.

SOSCOE architecture uses commercial-off-the-shelf hardware and a Joint

Tactical Architecture—Army compliant operating environment to produce a nonproprietary, standards-based component architecture for real-time, near-real-time and non-real-time applications. SOSCOE also contains administrative applications that provide capabilities including login service, startup, logoff, erase, memory zeroize, alert/emergency restart and monitoring/control. SOSCOE's framework allows for integration of critical interoperability services that translate Army, Joint and coalition formats to native, internal FCS message formats using a common format translation service. Because all interoperability services use these common translation services, new external formats will have minimal impact on the

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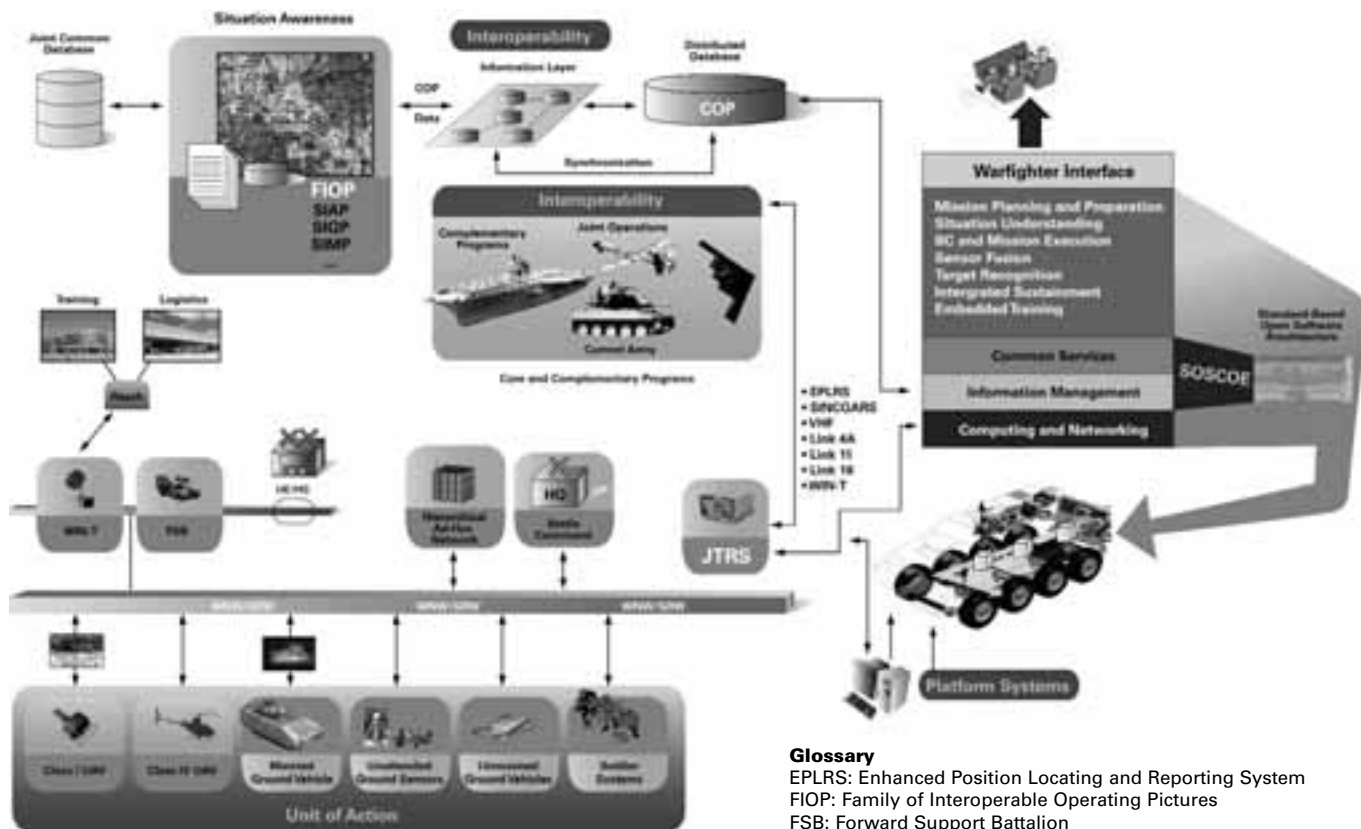
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## BC Software

BC mission applications include: mission planning and preparation, situation understanding, BC and mission execution and warfighter-machine interface (WMI). These four software packages' combined capabilities enable full interaction among the FCS-equipped Units of Action (UAs) with systems. BC capabilities will be common to, and tightly integrated into, all FCS and will share a common framework to achieve the long-desired goal of an integrated and interoperable system with no hardware, software or information stovepipes.

The *Mission Planning and Preparation* package consists of 16 services embedded within SOSCOE. They support the development of deliberate, anticipatory and rapid-response plans;



## The FCS Network Management System

### Glossary

EPLRS: Enhanced Position Locating and Reporting System

FIOF: Family of Interoperable Operating Pictures

FSB: Forward Support Battalion

SIAP: Single Integrated Air Picture

SIGP: Single Integrated Ground Picture

SIMP: Single Integrated Maritime Picture

SINGGARS: Single Channel and Ground Airborne Radio System

UAV: Unmanned Aerial Vehicle

the ability to perform plan assessments and evaluations; terrain analysis; mission rehearsals; and after-action reviews for the UA. As an example of the capabilities provided by this package, consider the FCS-networked fires key performance parameter (KPP). This package's predictive planning capabilities pre-approve airspace for weapons/munitions to target pairings so that when the decision to engage a target is made, the available weapons/munitions are already understood.

The 10 *Situation Understanding* package's services allow warfighters to better comprehend the battlespace and gain information superiority. The package includes map information and situational awareness (SA) database maintenance, which performs fusion as follows:

- Situation refinement that fuses spatial and temporal relationships among objects, grouping objects and abstract interpretation of the patterns in the order of battle.
- Threat refinement that combines activity with capability of enemy forces, infers enemy intentions and performs threat assessment.
- Process refinement that monitors the fusion process itself, assesses the accuracy of the fusion process and regulates the acquisition of data to achieve optimal results.

The *BC and Mission Execution* package contains planning and decision aids that assist the commander in making quick, informed and accurate decisions to best prosecute the battle. These services are fully independent of mode — training, rehearsal or operational — and are

intended to support manual to autonomous operations.

The *WMI* package provides the capabilities to present Soldier information and receive Soldier information. *WMI* provides a common user interface across multiple platforms supporting the common crew station and “personal digital assistant” display system. It considers parameters such as echelon, type of system being used and the warfighter's role to tailor information presentation.

### CC Systems

The FCS FoS are connected to the command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) network by a multilayered CC network with unprecedented range, capacity and

dependability. The CC network provides secure, reliable access to information sources over extended distances and complex terrain. The network will support advanced functionalities such as integrated network management, information assurance and information dissemination management to ensure dissemination of critical information among sensors, processors and warfighters within and external to the FCS-equipped organization.

The CC network does not rely on a large and separate infrastructure because it is primarily embedded in the mobile platforms and moves with the combat formations. This enables the C4ISR network to provide superior BC on the move to achieve offensive-oriented, high-tempo operations.

The FCS communication network is comprised of several homogenous communication systems such as Joint Tactical Radio System (JTRS) Clusters 1 and 5 with Wideband Network Waveform (WNW) and Soldier Radio Waveform (SRW), Network Data Link and Warfighter Information Network—Tactical (WIN-T). FCS leverages all available resources to provide a robust, survivable, scalable and reliable heterogeneous communications network that seamlessly integrates ground, near-ground, airborne and space-borne assets for constant connectivity and layered redundancy.

The figure on Page 13 shows that every FCS vehicle in the UA will be

equipped with a 4- or 8-channel JTRS Cluster 1. Soldiers and other weight- and power-constrained platforms will be equipped with a 1- or 2-channel

JTRS Cluster 5. In addition to the WNW and SRW communications backbone, the software-programmable JTRS will support other waveforms to ensure current force Joint, Interagency and Multinational (JIM) interoperability. The WIN-T will provide additional communications capability within the UA, as well as reach to echelons above — intra- and inter-UA, and UA to unit of employment (UE) — and range extension.

The FCS Network Management System manages the entire UA network including radios with different waveforms, platform routers and local area networks (LANs), information assurance elements and hosts. It provides a full spectrum of management capabilities required

during all mission phases, including pre-mission planning, rapid network configuration upon deployment in the area of operations, monitoring the network during mission execution and dynamic adaptation of network policies in response to network performance and failure conditions.

FCS will employ an integrated computer system to host the SOSCOE, ensure common processing, support networking and employ consistent data storage/retrieval across all FCS platforms and applications. The integrated computer system consists of

processors, storage media, dynamic memory, input/output devices, LANs and operating systems. A suite of seven computing system types have been identified to meet the various FCS platform-specific requirements for security, processing capability, computational capacity, throughput, memory, size, weight and power.

## ISR

A distributed and networked array of multispectral ISR sensors provides FCS with the ability to “see first.” ISR assets within the UA — as well as those external to the UA and at higher echelons — will provide timely and accurate SA, enhance survivability by avoiding enemy fires, enable precision networked fires and maintain contact throughout engagement. FCS will process real-time ISR data, outputs from survivability systems, SA data and target identification information to update the common operating picture (COP) containing information on friendly forces, battlespace objects (BSOs), BSO groupings and their associated intent, threat potential and vulnerabilities. The real-time distribution and dissemination of information and data are reliant on robust, reliable and high-capacity network data links.

To provide warfighters with actionable information, the data from the various distributed ISR and other sensor assets are subject to complex data processing, filtering, correlation, aided target recognition and fusion. The Sensor Data Management (SDM) software organizes all the sensor data — including detection reports — and tracks information as received from the sensor packages. Data are then processed and fused to synthesize information about the object, situation, threat and ongoing ISR processes. In addition to receiving data from FCS organic sensors, SDM has the capability to receive sensor data

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from nonorganic sources, including current forces and JIM. SDM will perform sensor data format conversions to output the data in FCS standard data formats.

### Force Transformation Through the Network

The FCS network is a cohesive and seamless architecture of battle command, communications, computers and ISR connected through the SOSCOE. The network is central to three of the seven transformational KPPs — Joint Interoperability, Networked Battle Command and Networked Lethality — and supports the remaining four — Transportability, Sustainability/Reliability, Training and Survivability. The network enables the

Future Force by providing the capabilities to see first, understand first, act first and finish decisively on the future battlefield.

COL JONATHAN A. MADDUX is the Project Manager for FCS Network Systems Integration. He has B.S. degrees in operational research systems analysis and English literature and language from Eastern Michigan University. He holds M.S. degrees in telecommunications, human resource management and strategic studies from the University of Colorado, Central Michigan University and Army War College, respectively. Military education includes the Project Management Course, Defense Systems Management College,

Army Command and General Staff College and the Army War College.

DR. GERARDO J. MELENDEZ is the Deputy Project Manager for FCS Network Systems Integration. He has a B.S. in biomedical engineering from Tulane University, an M.S. in electrical engineering from Brown University, a post-master's in electrical engineering from Princeton University and a Ph.D. in electrical engineering (digital signal processing and neural networks) from Drexel University. He also received an M.S. in strategic studies from the Army War College.

## System-of-Systems Integration: The Most Ambitious Army Program Ever

Scott Davis and Tom Bagwell



### System-of-Systems

Future Combat Systems integration as a system-of-systems (SoS) through a network environment will provide total operational capabilities not achievable by individual platforms. This SoS includes integration of 19 systems that make up the FCS Family-of-Systems (FoS); integration across the distributed system functions that include command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR); logistics and training; and integration with complementary programs such as Commanche, Warfighter Information Network-Tactical and High-Mobility Artillery Rocket System. FCS-equipped battalions will make up the unit of action (UA). Integration of these

combat, combat support, sustainment and C4ISR systems into a networked SoS enables the UA to operate as a fully integrated combined arms force and will facilitate interoperability with the unit of employment (UE) and Joint, Interagency and Multinational (JIM) forces.

Unprecedented FCS network integration will allow the UA to:

- Share superior situational awareness.
- Engage the enemy at tactically significant standoff ranges.
- Mass effects at the time and place the UA commander chooses.
- Move to the most advantageous points in time and space to engage the enemy — offensively and defensively.

- Employ area force protection and avenge-kill capabilities to enhance force survivability.
- Synchronize pulsed resupply with combat operations to maintain high operational tempo.
- Conduct embedded, distributed mission training and mission rehearsal to enhance proficiency.

These capabilities can only be achieved through highly networked operations that leverage the ability of individual elements to achieve synergistic effects. While the FCS is designed to function in a highly collaborative manner as a tightly integrated SoS, it will still maintain the capability of independent action by individual units and platforms.